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23701	7590	11/17/2004	EXAMINER	
RAUSCHENBACH PATENT LAW GROUP, LLC			MOORE, KARLA A	
P.O. BOX 387			ART UNIT	
BEDFORD, MA 01730			PAPER NUMBER	
			1763	

DATE MAILED: 11/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/604,502

Applicant(s)

SFERLAZZO, PIERO

Examiner

Karla Moore

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) 32-43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-31 and 44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-44 are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1103,1203,0304,0604,0904
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-31 and 44, drawn to an atomic layer deposition system, classified in class 118, subclass 719.
  - II. Claims 32-43, drawn to a method of atomic layer deposition, classified in class 427.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the process as claimed can be practiced by another materially different apparatus, for instance one that does not comprise a deposition chamber.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Mr. Kurt Rauschenbach on 19 October 2004 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-31 and 44. Affirmation of this election must be made by applicant in replying to this Office action. Claims 32-43 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

### *Claim Rejections - 35 USC § 102*

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section

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351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-18, 20, 24-31 and 44 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Publication No. 2003/0194493 A1 to Chang et al.

Chang et al. disclose an atomic layer deposition system in Figures 1 and 2 comprising: a deposition chamber (150); a first reaction chamber (202A; para. 35) that is positioned in the deposition chamber and that contains a first reactant species, a monolayer of the first reactant species becoming deposited on a substrate passing through the first reaction chamber; a second reaction chamber (202B) that is positioned in the deposition chamber, the second reaction chamber containing a second reactant species, a monolayer of the second reactant species being deposited on a substrate passing through the second reaction chamber; a transport mechanism (102; para. 34 and 37) that transports a substrate in a path through the first reaction chamber and through the second reaction chamber at a constant transport rate (para. 49), thereby depositing a film on the substrate by atomic layer deposition, wherein the shape of at least one of the first and second reaction chambers is chosen to achieve a constant exposure of the substrate to a respective one of the first and second reactant species when the transport mechanism transports the substrate in the path through the respective one of the first and second reaction chamber at the constant transport rate (see positioning and shape of reaction chambers in Figures 1 and 2).

Examiner notes that the transport rate is a process variable and not a structural limitation. In the disclosure of Chang et al. at paragraphs 40 and 49 Chang et al., it is taught that the rate may be controlled to produce a layer with a desired thickness. Examiner also notes that the courts have ruled that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959).

7. With respect to claim 2, a first and a second radial edge of at least one of the first and second reaction chambers is aligned to a center of the deposition chamber (see Figure 2).

8. With respect to claim 3, at least one of the first and second reaction chambers is formed in the shape of a trapezoid (see Figure 2).

9. With respect to claim 4, the system may further comprise a processing region (any of the additional chambers/stations 202C-F) that is positioned in the deposition chamber, a surface treatment being performed on a substrate passing through the processing region.
10. With respect to claim 5, at least one of the first reaction chamber and second reaction chamber comprises a plasma generator (para. 54) generating a plasma in the at least one of the first and the second reaction chambers for plasma enhanced deposition.
11. With respect to claim 6, at least one of the first reaction chamber and the second reaction chamber comprises a seal (204A-F; para 35) that is chosen from the group comprising a sliding seal, a corrugated seal and a gas curtain.
12. With respect to claim 7, at least one of the first reaction chamber and the second reaction chamber comprises a differentially pumped interface (para. 33).
13. With respect to claim 8, the first reaction chamber comprises a first gas injection manifold (120A; para. 38) and the second reaction chamber comprises a second gas injection manifold (120B), the first and the second gas injection manifolds providing a respective one of the first and second reactant species to the first and second reaction chambers.
14. With respect to claim 9, the first reaction chamber and the second reaction chamber transport relative to the substrate (para. 37). The first and second reaction chambers are characterized and differentiated by the gas supplies that may be rotated instead of the platen (i.e. they are transported relative to the substrate).
15. With respect to claim 10, Chang et al. further disclose an atomic layer deposition system in Figures 1 and 2 comprising: a deposition chamber (150); a first reaction chamber (202A; para. 35) that is positioned in the deposition chamber and that contains a first reactant species, a monolayer of the first reactant species becoming deposited on a substrate passing through the first reaction chamber; a second reaction chamber (202B) that is positioned in the deposition chamber, the second reaction chamber containing a second reactant species, a monolayer of the second reactant species being deposited on a substrate passing through the second reaction chamber; a processing region (any of the additional chambers/stations 202C-F) that is positioned in the deposition chamber, a surface treatment being

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performed on a substrate passing through the processing region; a transport mechanism (102; para. 34 and 37) that transports a substrate in a path through the first reaction chamber, through the second reaction chamber and through the processing region, thereby depositing a film on the substrate by atomic layer deposition.

With respect to claim 11, a shape of at least one of the first and second reaction chambers is chosen to achieve a constant exposure of the substrate to a respective one of the first and second reactant species when the transport mechanism transports the substrate in the path through the respective one of the first and second reaction chamber at the constant transport rate (see positioning and shape of reaction and processing chambers in Figures 1 and 2). Examiner notes that the transport rate is a process variable and not a structural limitation. In the disclosure of Chang et al. at paragraphs 40 and 49 Chang et al., it is taught that the rate may be controlled to produce a layer with a desired thickness. Examiner also notes that the courts have ruled that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959).

16. With respect to claim 12, at least one of the first reaction chamber and second reaction chamber comprises a plasma generator (para. 54) generating a plasma in the at least one of the first and the second reaction chambers for plasma enhanced deposition.

17. With respect to claim 13, at least one of the first reaction chamber and the second reaction chamber comprises a seal (204A-F; para 35) that is chosen from the group comprising a sliding seal, a corrugated seal and a gas curtain.

18. With respect to claim 14, at least one of the first reaction chamber and the second reaction chamber comprises a differentially pumped interface (para. 33).

19. With respect to claim 15, the first reaction chamber comprises a first gas injection manifold (120A; para. 38) and the second reaction chamber comprises a second gas injection manifold (120B), the first and the second gas injection manifolds providing a respective one of the first and second reactant species to the first and second reaction chambers.

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20. With respect to claim 16, a shape of a respective one of the first and the second gas injection manifolds is chose to provide a substantially constant flow of reactant species as the substrate passes through a respective one of the first and the second reaction chambers (para. 44 and 47).
21. With respect to claim 17, the processing region is formed in a shape that causes a substantially constant exposure of the surface treatment being performed on the substrate passing through the processing region (see shape and positioning of reaction and processing chambers in Figure 1 and 2).
22. With respect to claim 18, the processing region may comprise a plasma generator (para. 54) that generates a plasma in the processing region, the substrate passing through the processing region being exposed to the plasma, thereby performing the surface treatment.
23. With respect to claim 20, the plasma generator comprises a downstream (external) generator that is remotely located relative to the deposition chamber (para. 54).
24. With respect to claim 24, the system further comprises a substrate support (206A-F) that supports the substrate as the transport mechanism transports the substrate in the path through the first reaction chamber, through the second reaction chamber and through the processing region.
25. With respect to claim 25, the first reaction chamber, the second reaction chamber and the processing region/chamber transport relative to the substrate (para. 37). The first and second reaction chambers and the processing regions/chamber are characterized and differentiated by the gas supplies that may be rotated instead of the platen (i.e. they are transported relative to the substrate).
26. With respect to claim 26, the system may further comprise third and fourth reaction chambers (any of chambers 202D-F, if the 202A-C are considered to be the first and second reaction chamber and the processing region).
27. With respect to claims 27 and 28, which are drawn to the reaction materials to be used during a specific use of the system, the courts have ruled that expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969).
28. With respect to claim 29, Examiner notes that the transport rate is a process variable and not a structural limitation. In the disclosure of Chang et al. at paragraphs 40 and 49 Chang et al., it is taught

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that the rate may be controlled to produce a layer with a desired thickness. Examiner also notes that the courts have ruled that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959).

29. With respect to claim 30, the system may further comprise a port (in structure 180; para. 32) for transporting a substrate into and out of the deposition chamber.

30. With respect to claim 31, the deposition chamber is capable of having a pressure chosen to direct reactant gas and by-product gas away from the first reaction chamber and the second reaction chamber (para. 33).

31. With respect to claim 44, the citation of "means for transporting" in claim 44 has invoked 112/6<sup>th</sup> paragraph (means plus function). The Examiner interprets the "transporting means" according to the disclosed specification and drawings as "a transport mechanism that supports substrates and transfers the substrates relative to the first reaction chamber, the second reaction chamber and the processing region".

32. Chang et al. disclose an atomic layer deposition system in Figures 1 and 2 comprising: means for transporting (the means has been interpreted as transport mechanism/wafer platen 102; para. 34 and 37) a substrate through a first reaction chamber (202A; para. 35) containing a first reactant species, thereby forming a monolayer of the first reactant species on the substrate; means for transporting (the means has been interpreted as transport mechanism/wafer platen 102; para. 34 and 37) a substrate through a second reaction chamber (202B) containing a second reactant species, thereby forming a monolayer of the second reactant species on the substrate; and means for transporting (the means has been interpreted as transport mechanism/wafer platen 102; para. 34 and 37) a substrate through a processing region, thereby performing a surface treatment on the substrate. Examiner notes that the means-plus-function language is recited in claim 44 in three different ways/limitations, all of which describe the same transporting structure. In the specification and the drawings of the presently claimed invention, only a single structure is used as transporting means for transporting a substrate through a first

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region, subsequently through a second region and finally through a third region. Similarly, the prior art relied upon uses a single structure for transporting a substrate through first through third regions.

***Claim Rejections - 35 USC § 103***

33. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

34. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. as applied to claims 1-18, 20, 24-31 and 44 in view of U.S. Patent No. 6,139,695 to Washburn et al.

35. Chang et al. disclose the invention substantially as claimed and as described above.

36. However, Chang et al. fail to teach the plasma generator comprises a magnetron that sputters a metal layer on the substrate passing through the processing region.

37. Washburn et al. teach using a sputtering magnetron as a means for generating plasma for the purpose of improving efficiency and deposition rates of a process and also to reduce the heating of a substrate (column 1, rows 16-26).

38. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a sputtering magnetron as the plasma generation means in Chang et al. in order to improve efficiency and deposition rates and also to reduce heating of a substrate as taught by Washburn et al.

39. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. as applied to claims 1-18, 20, 24-31 and 44 in view of Japanese Patent No. 02082616A to Hishikawa et al.

40. Chang et al. disclose the invention substantially as claimed and as described above.

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41. However, Chang et al. fail to teach ion gun or electron gun generating an ion beam and an electron beam, respectively, the beam striking the substrate passing through the processing region, thereby performing the surface treatment.

42. Hishikawa et al. teach the use of an ion gun or electron gun as an energy source for the purpose of providing an accurately controllable irradiation beam, thereby enhancing the quality of a thin film produced (abstract).

43. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an ion gun or an electron gun as an energy source in Chang et al. in order to provide an accurately controllable irradiation beam, thereby enhancing the quality of the thin film produced as taught by Hishikawa et al.

44. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. as applied to claims 1-18, 20, 24-31 and 44 in view of U.S. Patent Publication No. 2002/0066411A1 to Chiang et al.

45. Chang et al. disclose the invention substantially as claimed and as described above.

46. However, Chang et al. fail to teach the processing region comprising a UV radiation source that generates UV radiation in the processing region, the UV radiation striking the substrate passing through the processing region, thereby performing the surface treatment.

47. Chiang et al. teach the use of a UV radiation source in an processing region for the purpose of rapidly heating a substrate (para. 44).

48. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a UV radiation source in the processing region in Chang et al. in order to rapidly heat a substrate as taught by Chiang et al.

### ***Conclusion***

49. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

USP 4,976,996; USP 5,281,274; USP 5,302,209; USP 5,747,113; USP Pub. 2001/0007244A1; USP

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6,319,553; USP 2002/0043216A1; and USP 2002/0046705 each disclose systems for continuously processing a substrate and/or systems capable of performing atomic layer deposition.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karla Moore whose telephone number is 571.272.1440. The examiner can normally be reached on Monday-Friday, 8:30am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 571.272.1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Karla Moore  
Art Unit 1763  
15 November 2004